FireWire Overview

Session 101

FireWire Overview

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Manager, FireWire Software

Introduction

- This session will review recent, current, and future developments for FireWire
    - What has changed since 2001?
    - Where are we now?
    - Where is FireWire going in 2002?
- What opportunities exist for FireWire product development?

What You'll Learn

- FireWire since WWDC 2001
- New services in Mac OS X
- Future work in Mac OS X
- Do's and Don'ts for 2002
- IEEE 1394b
- Developer resources

FireWire
Since WWDC 2001

FireWire in 100% of Macs

- All Macintosh products have built-in FireWire
- 2 ports on desktops, 1 port on portables
- All provide cable power and 6-pin connector(s)
- All support S100, S200, and S400

iPod: 2000 Songs in Your Pocket

- Apple's first FireWire peripheral
- Demonstrates FireWire's strengths
  - Cable power (recharge)
  - Hot plug (auto synchronize)
  - Speed (10x faster than USB)
  - Size (imagine a SCSI version!)

iPhoto: FireWire Still Cameras

- iPhoto is not just for USB

Nikon D1 series

Why FireWire Still Cameras?

- A USB 2.0 camera could be fast
- But USB's installed base is mostly USB 1.1
- Even a fast USB 2.0 camera will be slow for most customers
- FireWire's installed base is nearly all fast S400
- A fast FireWire camera is fast for all customers
- Much more power on FireWire than USB

Zayante

- Welcome Michael Johas Teener, Prashant Kanhere, and many talented engineers
- Big boost to Apple, and our developers

Emmy

- Awarded to Apple's FireWire by the Academy of Television Arts and Sciences

FireWire
New Services in Mac OS X

SCSITask User Client

- Last year, FireWire SCSI architecture (SAM) devices required an SBP-2 driver
- Now, most SAM devices can use the SCSITask User Client from application space

AVC User Client

- Application-level services for audio/video devices
- Function Control Protocol (FCP)
- Many command sets (1394 Trade Association)

DV in Darwin

- DV capture, export, and control were undocumented and secret for many years
- DV driver now in Darwin: IOFireWireDV

More New Resources

- Expanded HeaderDoc for FireWire—in SDK
- FireWire User Client Guide

  "Working With FireWire Device Interfaces"

developer.apple.com/techpubs/macosx/Darwin/IOKit/iokit.html

- More SDKs (12 for Mac OS X so far)
- CPU Developer Notes for each Macintosh
  - Architecture, power ratings, etc.

FireWire
Future Work in Mac OS X

IIDC Driver in Jaguar

- IIDC (“DCAM”) camera support in QuickTime

Demo

IIDC (DCAM) Camera Driver

AVC User Client in Jaguar

- Asynchronous Connections service layer
  - Used in Canon DV cameras, other protocols
- Subunit enumeration
- AVC Target support
  - Receive AVC commands
- DV driver moves to User space
  - Uses AVC User Client and isochronous services in the FireWire User client

After Jaguar: IP1394

- Internet Protocol (IP) was not designed for 1394
  - Enables use of many established services
  - But is not the best performance choice
- IP is better for management than data on 1394
- IP may be more convenient
  - Compare to Target Disk Mode
- Developer input needed to drive schedule

After Jaguar: SBP-3

- Serial Bus Protocol (SBP) is used in disk drives, CD, DVD, Scanners, Printers, Still Cameras, etc.
    - Current revision is SBP-2
- SBP-3 adds new services
    - Fast Start: Significant performance boost
    - 1394.1: More devices; Better bus resets
    - Isochronous services

FireWire Dos and Don’ts (2002)

Do—Innovate

- Innovate on features, performance, synergy
    - Find new ways to use FireWire
    - Make products faster than before
    - Make products work together
- But don’t find innovative ways to deviate from the IEEE standards
    - Participate in the standards process instead

Do—Test With Bus Resets

- Bus Resets happen—they are not errors
  - Device connected, removed, powered on/off, or changed state
- Follow the standards and Bus Resets won't hurt
  - Standards define how to continue operation
- Test your devices and software with bus resets
  - Tool to be added to SDK (after SDK 12)

Do—Operate on Cable Power

- Apple products provide lots of FireWire power
  - You should make use of it
- iPod demonstrates the potential
  - FireWire is iPod's only power connection!
  - USB is limited to 2.5 (or 0.5) Watts per device
  - Apple FireWire ports provide 6 to 15 Watts

Do—Attend 1394 TA Plugfests

- The 1394 Trade Association is now rolling out a new Compliance program centered on Plugfests
  - Test with engineers from many 1394 vendors
  - Standard test suites being deployed
  - Now open to non-member companies

Do—Attend 1394 TA DevCon

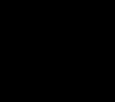
- June 25–27 at Microsoft
- Hardware design, drivers (Windows and Mac), new and future standards, content protection, automotive, Knowledgetek, and more
- “Ask the Experts” with Apple and Microsoft

Don’t—Use the 4-pin Connector

- No power
- Awkward
- Fragile

Don’t—Design From Datasheets

- Vendor datasheets are not a substitute for the 1394 standards!
- 1394 is a sophisticated, powerful interface
- Read and follow the 1394 standards when designing your product



Don’t—Ask for Workarounds

- Most 1394 developers are great about this
    - Much better than other interconnects
- Occasionally we are asked to write software workarounds for someone else’s mistake
- Our answer: No

Don’t—Think USB 2.0 Is Equal

- USB 2.0 High Speed is similar to S400 FireWire
- But OS support is limited
- USB 2.0 power is still just 2.5 (or 0.5) Watts
- USB’s installed base is not an asset
    - Most customers have USB 1.1 ports and will be dissatisfied with the performance of High Speed USB 2.0 devices
    - Avoid this negative customer experience

FireWire
IEEE 1394b

Michael Johas Teener
Plumbing Architect

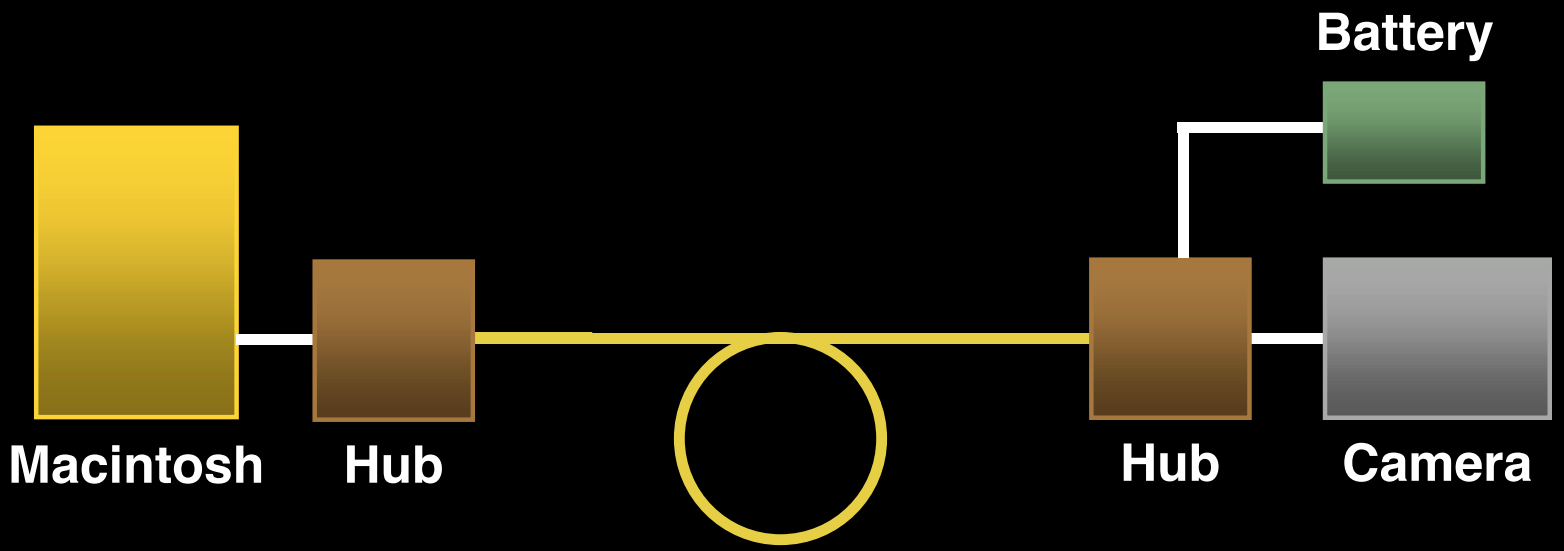
IEEE 1394b

- Defines higher speeds: 800 and 1600 mbps
- Defines longer distances: up to 100m
    - Even longer distances appear to be possible
- Defines new media: UTP, POF, GOF
    - Still supports short-haul copper
- Fully compatible and interoperable with 1394a

Demo

1394b Fiber Optic Transceiver

1394b Fiber Optic Demo



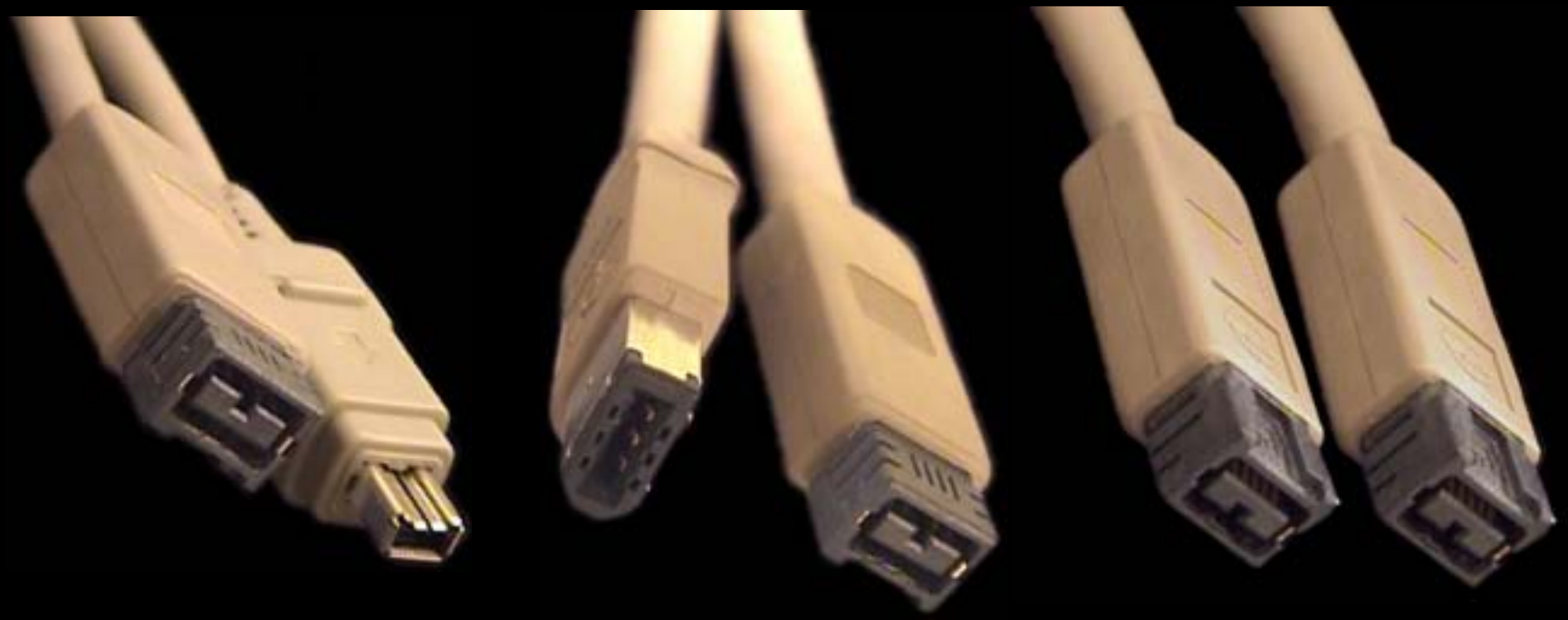
1394b Arbitration

- 1394b “BOSS” arbitration is more efficient than 1394a and 1394-1995
  - 1394b at S800 is more than twice as fast as 1394a at S400
  - How?
    - Arbitrate during previous packet
    - No more “gaps” of idle time
    - >97% of bandwidth for data (4K writes at S800)

1394b—A New Connector

- Today's 1394 cables cannot carry 800+ mbps
- A new connector guarantees the use of new, higher-grade cables

1394b—Three New Cables



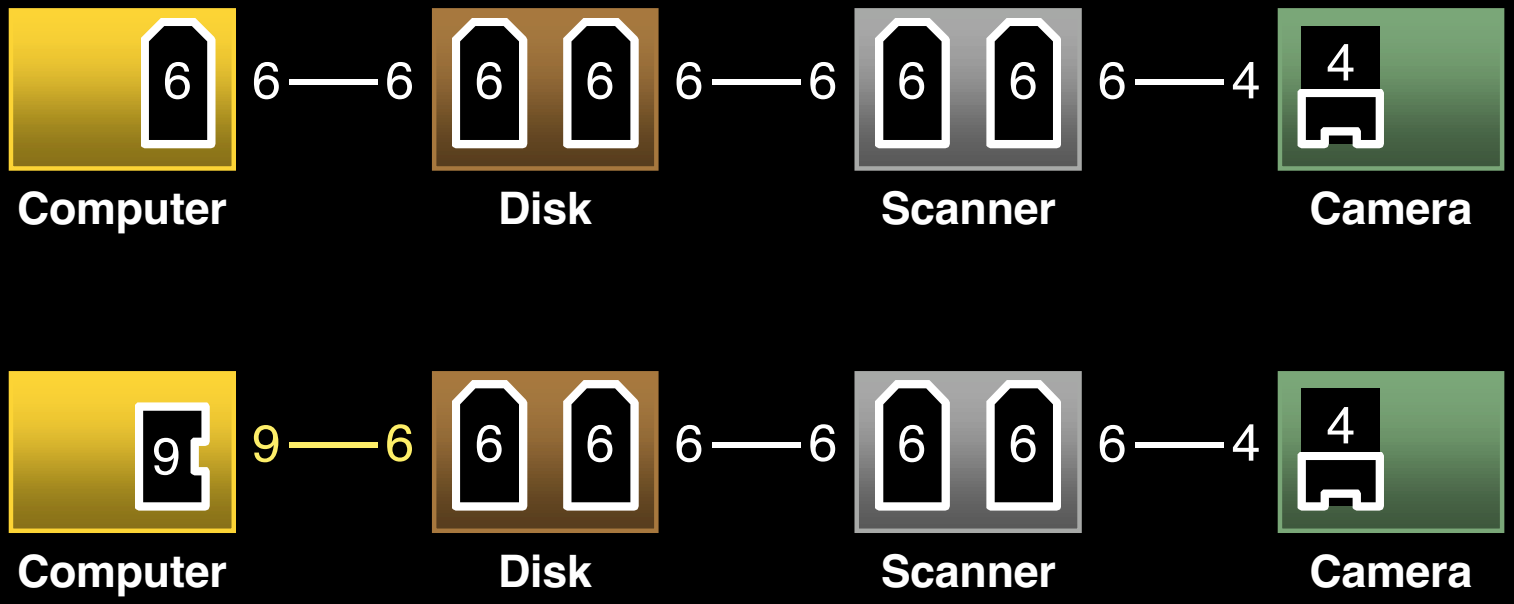
9-to-4

9-to-6

9-to-9

1394b—One New Cable

- Customer may need only one new 1394b cable



Using 1394b in Products

- 1394b is a “package deal”
  - New connector (9-pin) = New PHY (1394b)
  - New PHY (1394b) = New connector (9-pin)
- Do not mix 1394a PHY and 1394b connector
- Do not mix 1394b PHY and 1394a connector

1394b Standard Update

- 1394b passed final ballot
  - January 25, 2002
  - Final draft revision was 1.33
- 1394b approved by IEEE for publication process
  - March 21, 2002

1394b Product Opportunities

- PCI cards for older Macs: 800 or 1600 mbps
- Hubs for long-haul: UTP, Optical Fiber
    - These work on 1394a Macs too
- Cables: 4–9, 6–9, 9–9, and long-haul
- Storage: ATA drives need 800 mbps already
- Isolation and distance enable pro-type products
- Innovate!

FireWire Developer Resources

Plugfest—Thursday!

- During Apple Campus Bash
- “Garage” room (above cafeteria)
- Test your FireWire devices
- Meet FireWire engineers
- Meet other FireWire developers

Plugfests—1394 Trade Assoc.

- Meet a much broader range of developers
- One-on-one testing for 2–3 days, plus “melee”
  - August 5–7 2002, Bellevue WA
  - October 2002, Taiwan
  - February 2003, USA West Coast?
  - April 2003, Tokyo?

Compliance Logo—1394 TA

- The 1394 Trade Association has licensed a Compliance Logo
  - Show customers your product has been tested
  - Obtain it from the 1394 TA
- Quantum Parametrics
  - Vendor to 1394 TA for compliance test suites

FireWire Kitchens

- A kitchen is 3–4 days with FireWire engineers and developers
    - Tutorials on latest FireWire services
    - Hands-on development and debug
    - Related presentations (e.g., PIMA/PTP)
- Cupertino and Tokyo, 2–3 times each year

Software Development Kits

- 12 FireWire SDKs for Mac OS X as of April 2002
- Latest FireWire drivers
- Sample code
- Documentation
- Source code
- Tools

Roadmap

111 Accessing SCSI and ATA Devices in Mac OS X Including the SCSITask User Client	Civic **Wed., 5:00pm**
115 FireWire in Depth Writing FireWire drivers and applications	Civic **Thurs., 3:30pm**
FireWire and USB Plugfest Test your devices during the Apple Bash	“Garage” Room **Thurs., 7:00pm**
FF009 FireWire and USB Feedback Forum Tell us what to do next	Room J1 **Fri., 9:00am**

More Roadmap

811 Zero Configuration Networking TCP/IP without manual configuration	Room J **Thurs., 2:00pm**
008 DiscRecording APIs Burning topics	Hall 2 **Thurs., 2:00pm**

Who to Contact

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Public FireWire Developers mailing list
To subscribe, visit:
http://lists.apple.com

Public Mass Storage Developers mailing list
To subscribe, write “subscribe x_mass_storage” to:
requests@sam.apple.com

http://developer.apple.com/wwdc2002/urls.html

For More Information

- FireWire SDKs
  developer.apple.com/hardware/FireWire/index.html
- "Working With FireWire Device Interfaces"
  developer.apple.com/techpubs/macosx/Darwin/IOKit/iokit.html
- 1394 Trade Association
  www.1394ta.org

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http://developer.apple.com/wwdc2002/urls.html


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